



Effect of feeding mustard cake on nutrient utilization in Pratapdhan chicks

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Abstract— The present study was designed to assess the effect of feeding mustard cake on nutrient utilization in Pratapdhan chicks. A total of 200 day-old straight run Pratapdhan chicks were randomly divided into four treatment groups with five replicates of 10 chicks each. The chicks were fed maize soyabean deoiled cake basal diet (T1, control) or with mustard cake included at 3% (T2), 6% (T3 and 9% (T4) in the diet replacing soya DOC by 10, 13, and 16%. A metabolism trial was conducted at 8 weeks of age to study nutrient utilization by Pratapdhan chicks. Results showed that supplementation of 6% Mustard cake in the diet significantly improved the CF intake, digestible CF intake in Pratapdhan chicks. The digestibility coefficients of crude protein (80.48%), crude fibre (76.54%), ether extract (84.65%) and NFE (75.94%) were significantly ($P<0.01$) higher in T3 compared to other treatments while digestibility remained lowest in control group. The protein and energy efficiency ratios were significantly ($P<0.01$) higher in T3 (1.94 and 13.90) compared to other treatment groups. Based on results of nutrient utilization it can be concluded that Mustard cake can be safely included in the diet of Pratapdhan chicks at 6 percent level for better digestibility of pratapdhan chicks.



Keywords— Pratapdhan, Mustard cake, Digestibility coefficient

I. INTRODUCTION

Poultry sector plays an important role carries a pivotal position in current Indian economy and has evolved as an extremely business oriented enterprise (Sreenivas *et al.*, 2013). The total poultry population in the country has increased by 16.81% over the previous census i.e. 2012 (BAHS, 2019). India ranks 7th in the world poultry population at 851.81 million (BAHS, 2019), 2nd largest producer of eggs with total production of 142.77 billion eggs, and 5th in meat production with 10.25 million tonnes meat in 2023-24. The per capita availability of is only 103 eggs and 7.39 kg meat per year (2023-24) which is far apart the level of 180 eggs per head per year and 10.5 kg of meat recommended by the ICMR, Govt. of India. Economically poultry meat and eggs are acquiring popularity due to its high nutritional value. Poultry meat is a nutritious food for children, young, adult and old people.

It contains high quality protein having all the essential amino acids in abundance for optimum human nutrition.

Among the vegetable protein sources soybean deoiled cake is the most commonly used protein source. Mustard or rapeseed is among the major oilseeds in the world, and belongs to the genus '*Brassica*' Mustard oil cake is a fairly good source of protein (31 to 39%) and energy (2200 kcal/kg), low in lysine (1.0 to 2%), but rich in methionine (1.01 to 1.57 %) compared to SBM (Vaidya *et al.*, 1979). Mustard cake is one of such vegetable protein which has relatively better composition of amino acid, however, utilization of mustard oil cake in poultry diets is limited due to the presence of certain intrinsic toxic principals (Vaidya *et al.*, 1979; Prasad and Rao, 1982a), which are known to lower the performance of birds when used at higher levels (>10%) in the diets of chicken (Vaidya *et al.*, 1979; Prasad and Rao, 1982a; Mc Neill and

Mac Leods, (2001). The information effect of feeding mustard cake on nutrient utilization in poultry is relatively limited and information on indigenous or improved chicken is scanty. The present study is a part of the research work carried out to study the effect of feeding mustard cake on growth performance and nutrient utilization in Pratapdhan chick.

II. MATERIAL AND METHODS

Experimental birds, diet and management

Two hundred Pratapdhan chicks were randomly divided into four different groups consisting of five replicates of 10 chicks each and fed four dietary treatments containing maize soybean deoiled cake diets supplemented with mustard cake at 0, 3, 6 and 9% levels in the diet. The diets contained composition mixture of maize, soya deoiled cake, deoiled rice bran and vitamin premix with mustard cake at different levels.

Pratapdhan chicks were procured from Hatchery of Poultry Farm, Department of Livestock Production Management, Rajasthan College of Agriculture, Udaipur. The chicks were reared under strict hygienic condition in the brooder house of the AICRP on Poultry Breeding, Poultry Farm, Department of Animal Production, Rajasthan College of Agriculture, Udaipur. Before housing the chicks, experimental brooder rooms, equipment and utensils were cleaned and disinfected thoroughly with phenol and fumigated with formaldehyde gas. The chicks (day old) were weighed at the beginning of the experiment and randomly divided into 4 groups. Rice husk was used as bedding material, thickness of bedding material was kept 2 inches initially which were subsequently increased by 0.5 inch. The chicks were vaccinated against Ranikhet, Marek's and Infectious Bursal Disease (IBD).

A metabolism trial was conducted at the end of the experiment i.e. 8 weeks of age to study nutrient utilization. Two birds from each replicate in a treatment were randomly selected and shifted to metabolic cage. Thus, a total of 10 birds from each treatment were used for

metabolism trial. During three days collection period quantity of feed offered, feed left over and excreta voided were recorded and taken for nutrient analysis. The proximate principles were estimated as per AOAC (2005). The protein efficiency ratio was calculated by following formula

$$\text{Protein efficiency ratio} = \frac{\text{Weight gain (g)}}{\text{Total Protein intake (g)}}$$

The energy efficiency ratio (EER) was calculated using following formula

$$\text{Energy efficiency ratio} = \frac{\text{Total Weight gain (g)}}{\text{Total Metabolizable Energy intake}} \times 100$$

Statistical methods

The experimental design was conducted in completely randomized design (CRD) and the data pertaining to various parameters obtained during growth, metabolic trial of the present study was analyzed by analysis of variance described by (Snedecor and Cochran, 1994).

III. RESULTS

Nutrient intake

A metabolism trial was conducted at the end of the feeding trial after 8th weeks of age. The data pertaining to nutrient intake and utilization is presented in Table 1.

The data pertaining nutrient intake and digestible nutrient intake is presented in Table 1. The difference in mean dry matter intake, crude protein intake, Ether extract intake and NFE intake amongst different groups was found to be small and statistically non-significant. However, the crude fibre intake and digestible crude fibre intake were significantly ($P < 0.01$) higher in T4 as compared to other treatments groups which may be due to inclusion of mustard cake at higher level.

Table-1. Effect of feeding of mustard cake on nutrient intake in Pratapdhan chicks

Particulars	T1	T2	T3	T4	SEm	CD
DM Intake (g/bird/d)	67.02±1.56	65.69±1.47	66.12±1.01	66.07±1.13	1.31	NS
Digestible DMI (g/bird/d)	46.59±1.48	46.16±1.54	45.75±0.21	46.62±1.11	1.21	NS
CP intake(g/bird/d)	13.53±0.31	13.03±0.29	13.31±0.20	13.52±0.23	0.26	NS
Digestible CP intake(g/bird/d)	10.31±0.30	10.07±0.30	10.71±0.21	10.62±0.23	0.26	NS
CF intake(g/bird/d)	1.59 ^c ±0.04	1.51 ^c ±0.03	1.77 ^b ±0.03	2.08 ^a ±0.04	0.03	0.11**

Particulars	T1	T2	T3	T4	SEm	CD
Digestible CF intake(g/bird/d)	1.23 ^c ±0.04	1.20 ^c ±0.03	1.49 ^b ±0.03	1.73 ^a ±0.04	0.03	0.11**
EE intake(g/bird/d)	2.65±0.06	2.79±0.06	2.66±0.04	2.56±0.04	0.05	NS
Digestible EE intake(g/bird/d)	1.89±0.06	2.04±0.06	1.99±0.03	1.89±0.04	0.05	NS
NFE Intake(g/bird/d)	47.17±1.10	46.42±1.04	46.35±0.71	45.78±0.78	0.92	NS
Digestible NFE intake(g/bird/d)	34.24±1.05	34.65±1.08	35.20±0.56	34.33±0.77	0.89	NS
Nitrogen intake(g/bird/d)	2.16±0.05	2.08±0.05	2.13±0.03	2.16±0.04	0.04	NS
Nitrogen balance(g/bird/d)	1.69±0.05	1.57±0.04	1.71±0.03	1.70±0.04	0.04	NS

The mean nitrogen balances (g/bird/day) were 1.69±0.05, 1.57±0.04, 1.71±0.03 and 1.70±0.04 g in T1, T2, T3 and T4 groups respectively. The difference in nitrogen balance amongst different groups was also found to be statistically non-significant.

Nutrient utilization

The data with respect to digestibility coefficients of nutrients as influenced by feeding of mustard cake at different levels is presented in Table 2. The mean

digestibility coefficients of dry matter was found to be non-significant amongst different treatment groups. The digestibility coefficients of CP, CF, EE and NFE were significantly ($P<0.01$) higher in T3 as compared to other treatment groups. the groups supplemented with mustard cake at 6% recorded highest digestibility coefficients of CP (80.48%), CF (76.54%), EE (84.65%) and NFE (75.94%). The digestibility of all the nutrients was found to be higher in group containing mustard cake at 6%. The digestibility coefficient was lowest in control group.

Table-2. Effect of feeding of mustard cake on nutrient digestibility coefficient in Pratapdhan chicks

Particulars	T1	T2	T3	T4	SEm	CD
DM	69.49±0.59	70.24±0.76	69.22±1.10	70.54±0.48	0.77	NS
CP	76.20 ^c ±0.46	77.26 ^b ±0.58	80.48 ^a ±0.36	78.55 ^b ±0.35	0.45	1.46**
CF	71.03 ^c ±0.56	72.97 ^b ±0.69	76.54 ^a ±0.43	73.66 ^b ±0.43	0.54	1.76**
EE	77.34 ^d ±0.44	79.69 ^c ±0.52	84.65 ^a ±0.28	82.89 ^b ±0.28	0.39	1.29**
NFE	72.57 ^b ±0.53	74.62 ^a ±0.65	75.94 ^a ±0.30	74.96 ^a ±0.41	0.49	1.60**
Total Protein intake (g)	353.75 ^c ±0.66	365.89 ^a ±0.62	352.86 ^c ±1.22	358.08 ^b ±1.36	1.02	3.06**
Protein Efficiency Ratio	1.47 ^c ±0.01	1.69 ^b ±0.05	1.94 ^a ±0.01	1.62 ^b ±0.05	0.04	0.11**
Total ME intake (Kcal)	4939.20 ^b ±17.94	5194.10 ^a ±52.83	4933.17 ^b ±15.32	4977.41 ^b ±12.43	22.64	67.88**
EER	10.53 ^c ±0.03	11.94 ^b ±0.50	13.90 ^a ±0.03	11.68 ^b ±0.12	0.25	0.74**

** $P<0.01$

Means bearing different superscripts in a row differ significantly.

The protein efficiency ratio was also calculated and values were 1.47±0.01, 1.69±0.05, 1.94±0.01 and 1.62±0.05 in T1, T2, T3 and T4 respectively. It was found the data that the protein efficiency ratio was significantly highest ($P<0.01$) in T3 followed by T2, T4 and lowest in T1. The

difference in protein efficiency ratio in T2 and T4 remained at par with each other.

The total metabolizable energy intake for the entire experimental period was calculated by multiplying total feed intake with ME content of the diets and the total mean ME intakes were 4939.20±17.94, 5194.10±52.83, 4933.17±15.32 and 4977.41±12.43 Kcal in T1, T2, T3 and T4 groups respectively. The overall body weight gains up

to 8th weeks of age were 520.14 ± 1.25 , 619.94 ± 6.25 , 685.83 ± 1.82 and 581.53 ± 4.74 g in T1, T2, T3 and T4 groups respectively.

The energy efficiency ratio was also calculated and values were 10.53 ± 0.03 , 11.94 ± 0.50 , 13.90 ± 0.03 and 11.68 ± 0.12 in T1, T2, T3 and T4 respectively. It was found the data that the energy efficiency ratio was significantly highest ($P < 0.01$) in T3 followed by T2, T4 and lowest in T1. The difference in protein efficiency ratio between T2 and T4 was found to be small and statistically non-significant.

IV. DISCUSSION

Banday *et al.* (2003) fed rape seed meal (RSM) with $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (4g/kg feed) and $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ (10g/kg feed) separately or in combination without or with supplemental iodine @ 6.67mg/kg RSM and incorporated in the diet at 15 per cent level for part of the soybean meal and de-oiled rice bran fed to three hundred per replicate. There was a significant ($P < 0.05$) improvement in the digestibility of different nutrients due to chemical processing of RSM with higher retention of various nutrients in the birds. It can be concluded that chemical processing of RSM was effective in detoxifying the RSM to a considerable extent that treated meal could be beneficially utilized as a protein supplement up to 15 per cent in the diet of broiler chicken up to 42 days age.

Thacker and Petri (2011) found that the digestibility of dry matter, energy and phosphorus increased linearly ($P < 0.01$) with increasing levels of canola protein concentrate. Although nutrient digestibility was higher for birds fed diets due to containing canola protein concentrate, these improvements did not translate into improvements in broiler performance.

Ivkovic *et al.* (2012) in a study three groups formed and fed either with corn-soy based diet (control group) or with inclusion of 10% (RSM 10%) or 15% of rapeseed meal (RSM 15%), respectively. No significant differences ($P > 0.05$) were observed in any measured digestibility parameter. However, in present study the digestibility of nutrient was significantly higher in group fed mustard cake at 6% level.

Sonowal *et al.* (2018) fed untreated and copper sulfate treated mustard oil cake at 0, 10, 15 and 20% to broiler chicken for a period of six weeks and found no significant effect of supplementation of mustard oil cake with or without treatment on digestibility of nutrients. However in present study mustard cake 6% improved digestibility of nutrients.

Smulikowska *et al.* (2006) in an experiment of broiler chicks fed rapeseed expeller cake and extruded cake at 10 and 15% of the diet in three phases, it was found that the apparent protein digestibility, nitrogen retention, organic matter retention, apparent metabolizable energy value and energy metabolizability were lower while fat digestibility was higher in RCE than in RC. The results of the present study are in agreement with the findings.

Mohanta *et al.* (2022) conducted a study to evaluate the performance of indigenous Nusuri chicken germplasm of Odisha maintained in floor rearing system. Seventy birds were selected for this study. Body weight, feed consumption, feed conversion ratio (FCR), energy efficiency ratio (EER) and protein efficiency ratio (PER) were calculated up to 20 weeks of age. The mean cumulative EER and PER was 9.07 and 1.23 at 8th week respectively. The highest and lowest protein efficiency ratio in the present study was 1.94 and 1.47 while the highest and lowest energy efficiency ratio was 13.90 and 10.53 respectively. The higher efficiency of protein as well as energy in the present study may be attributed to genetic inheritance of the birds, in present study Pratapdhan an improved chicken was used as compared to indigenous chicken in the study by Mohanta *et al.* (2022) with slower growth rate.

Zahid Kamran *et al.* (2008) found that total protein intake was decreased ($P < 0.01$) and protein efficiency ratio was increased ($P < 0.01$) linearly with low CP diets. In the present study the protein and energy efficiency ratio was increased in the diets supplemented with mustard cake at 6% as compared to other dietary treatments.

V. CONCLUSION

The mean digestibility of nutrients such as CP, EE, CF and NFE were significantly higher in T3 group which was fed mustard cake at 6% of the diet as compared to other groups. In the present study the protein and energy efficiency ratio was also increased in the diets supplemented with mustard cake at 6% as compared to other dietary treatments.

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